CLAIMS

1. A method for increasing pressure in a closed-loop system comprising a pump for pumping fluid in said system, a heat-generating component and a heat-rejection component, said method comprising the steps of:

situating a venturi in series in said closed-loop system; and

providing a predetermined pressure at a throat of said venturi;

using said pump to cause flow in said closed-loop system in order to increase pressure in said system, thereby increasing said boiling point of the fluid, said overall pressure being greater than said predetermined pressure;

providing a second accumulator and a valve to cause fluid to be passed to said heat-generating component when said pump is not pumping.

2. The method as recited in claim 1 wherein said method further comprises the step of:

establishing said predetermined pressure to be atmospheric pressure at said throat.

3. The method as recited in claim 1 wherein said method further comprises the step of:

situating an expansion tank at said throat.

4. The method as recited in claim 1 wherein said method further comprises the step of:

providing a switch for controlling the operation of said heat-generating component and causing said component to be turned on or off if a flow in said closed-loop system is above or below a predetermined flow rate.

5. The method as recited in claim 1 wherein said heat-generating component comprises an X-ray tube.

6. The method as recited in claim 4 wherein said method comprises the step of:

situating said switch downstream of said venturi.

7. The method as recited in claim 4 wherein said predetermined pressure of that remains substantially constant as a rate of said flow changes.

8. The method as recited in claim 7 wherein said predetermined pressure is atmospheric.

9. The method as recited in claim 7 wherein said method comprises the step of:

situating said switch adjacent either an inlet or outlet of said venturi.

10. The method as recited in claim 9 wherein said switch is situated upstream of said pump and downstream of said venturi.

11. The method as recited in claim 1 wherein said valve is a check valve.

12. The method as recited in claim 11, wherein check valve is situated between said second accumulator and said pump.

13. A cooling system for cooling a component comprising:

a heat-rejection component;

a pump for pumping fluid to said heat-rejection component and said component;

a conduit for communicating fluid among said component, said heat-rejection component and said pump, said conduit comprising a venturi having a predetermined pressure applied at a throat of said venturi, an expansion tank;

a closed expansion tank coupled to said conduit; and

a valve coupled to said conduit;

said valve and said closed expansion tank cooperating to cause flow in second conduit to cool the component when said pump is deactivated.

14. The cooling system as recited in claim 13 wherein said predetermined pressure is atmospheric pressure.

15. The cooling system as recited in claim 13 wherein said predetermined pressure is provided by a second expansion tank in communication with a throat of said venturi.

16. The cooling system as recited in claim 15 wherein said second expansion tank comprises a diaphragm having one side in communication with said fluid and an opposite side subject to atmospheric pressure.

17. The cooling system as recited in claim 13 wherein said system further comprises a switch situated in said conduit for generating a signal used to control operation of said component when a flow rate of said fluid is not at a predetermined flow rate.

18. The cooling system as recited in claim 17 wherein said switch is a pressure switch measures fluid pressure relative to atmospheric pressure.

19. The cooling system as recited in claim 17 wherein said switch is located upstream of said pump.

20. The cooling system as recited in claim 18 wherein said switch is located downstream of said venturi and upstream of said pump.

21. The cooling system as recited in claim 20 wherein said component comprises an X-ray tube.

22. The cooling system as recited in claim 14 wherein said system further comprises a switch situated in said conduit for generating a signal used to control operation of said component when a flow rate of said fluid is not at a predetermined flow rate.

23. The cooling system as recited in claim 22 wherein said switch is located either upstream or downstream of said venturi and upstream of said pump.

24. The cooling system as recited in claim 23 wherein said component comprises an X-ray tube.

25. The cooling system as recited in claim 23 wherein said component comprises an internal combustion engine.

26. The cooling system as recited in claim 23 wherein said component comprises a hydronic boiler.

27. The method as recited in claim 13 wherein said valve is a check valve.

28. The method as recited in claim 27, wherein check valve is situated between said second accumulator and said pump.

29. An X-ray system comprising:

an X-ray apparatus for generating X-rays, said X-ray apparatus comprising an X-ray tube situated in an X-ray tube casing; and

a cooling system for cooling said X-ray tube, said cooling system comprising:

a heat-rejection component coupled to said X-ray tube casing;

a pump for pumping fluid to said heat-rejection component and said component;

a conduit for communicating fluid among said X-ray tube casing, said heat-rejection component and said pump, said conduit comprising a venturi having a predetermined pressure applied at a throat of said venturi, an expansion tank;

a closed expansion tank located between said pump and said heat-rejection component; and

a valve located between said pump and said closed expansion tank.

30. The X-ray system as recited in claim 29 wherein said predetermined pressure is atmospheric pressure.

31. The X-ray system as recited in claim 29 wherein said predetermined pressure is provided by a second expansion tank in communication with a throat of said venturi.

32. The X-ray system as recited in claim 31 wherein said second expansion tank comprises a diaphragm having one side in communication with said fluid and an opposite side subject to atmospheric pressure.

33. The X-ray system as recited in claim 29 wherein said system further comprises a switch situated in said conduit for generating a signal used to control operation of said component when a flow of said fluid is not a predetermined flow rate.

34. The X-ray system as recited in claim 33 wherein said switch is a pressure switch that measures fluid pressure relative to atmospheric pressure.

35. The X-ray system as recited in claim 33 wherein said switch is located downstream or upstream of said venturi and upstream of said pump.

36. The X-ray system as recited in claim 30 wherein said system further comprises a switch situated in said conduit for generating a signal used to control operation of said component when a flow of said fluid is not at a predetermined flow rate.

37. The X-ray system as recited in claim 36 wherein said switch is located either upstream or downstream of said venturi and upstream of said pump.

38. The X-ray system as recited in claim 34 wherein said predetermined pressure equals atmospheric pressure.

39. The X-ray system as recited in claim 33 wherein said predetermined pressure equals atmospheric pressure.

40. The X-ray system as recited in claim 36 wherein said switch is located downstream of said venturi and upstream of said pump.

41. The method as recited in claim 29 wherein said valve is a check valve.

42. The method as recited in claim 41, wherein check valve is situated between said second accumulator and said pump.

43. A method for cooling a component situated in a system; said method comprising the steps of:

providing a conduit coupled to said component;

coupling said component casing to a pump for pumping a cooling fluid through said conduit and to a heat-rejection component;

situating a first accumulator in the conduit, and a second accumulator in the conduit, said first and second accumulators being arranged on said conduit to force fluid flow from the second accumulator to the first accumulator and through said conduit when said pump ceases pumping.

44. The method as recited in claim 43 wherein said increasing step further comprises the step of:

increasing an overall pressure of said fluid in said conduit.

45. The method as recited in claim 44 wherein said method further comprises the steps of:

providing a venturi in said conduit in order to increase said overall pressure;

holding a throat pressure at a throat of said venturi to a predetermined pressure.

46. The method as recited in claim 45 wherein said predetermined pressure is atmospheric pressure.

47. The method as recited in claim 46 wherein said method further comprises the step of situating an expansion tank in communication with a throat of said venturi.

48. The method as recited in claim 47 wherein said expansion tank comprises a diaphragm having one side in communication with said fluid and an opposite side subject to atmospheric pressure.

49. The method as recited in claim 43 wherein said method further comprises the step of:

terminating power to said component when a flow of said fluid is less than a minimum flow rate.

50. The method as recited in claim 47 wherein said method further comprises the step of:

providing a switch for causing power to said component to be terminated when a flow rate in said conduit is less than a minimum flow rate.

51. The method as recited in claim 50 wherein said switch is a pressure switch.

52. The method as recited in claim 51 wherein said switch is located either upstream or downstream of said venturi and upstream of said pump.

53. The method as recited in claim 45 wherein said method further comprises a switch situated in said conduit for generating a signal used to terminate operation of said component when a flow rate of said fluid is less than a predetermined flow rate.

54. The method as recited in claim 43 wherein said switch is located downstream of said venturi and upstream of said pump.

55. The method as recited in claim 49 wherein said minimum flow rate is less than about 1 GPM when a velocity of said fluid at the throat of said venturi is at least 16 Ft./Sec.

56. The method as recited in claim 50 wherein when said minimum flow rate is about zero, the pressure in the system goes to atmospheric at substantially the same time.

57. The method as recited in claim 43 wherein said component comprises an X-ray tube.

58. The method as recited in claim 55 wherein said component comprises an X-ray tube.

59. The method as recited in claim 43, wherein preventing step comprises the steps of:

providing a closed accumulator as said second accumulator;

providing a valve between said pump and said closed accumulator.

60. The method as recited in claim 59, wherein said valve is a check valve.

61. A method for cooling a heat-generating component in a closed-loop hydraulic system, such method comprises the steps of:

situating an accumulator in a conduit coupled to said heat-generating component, said accumulator accumulating fluid when pressure in the conduit is above a first pressure, and forcing said fluid into said conduit and to said heat-generating component when said pressure in said conduit falls below said first pressure.

62. The method as recited in claim 61 comprising the step of:

situating a venturi in said conduit with a throat of said venturi held at a predetermined pressure.

63. The method as recited in claim 62 wherein said method further comprises the step of:

situating a second accumulator at said throat of said venturi.

64. The method as recited in claim 61, said method further comprises the step of:

situating said heat-generating component between said venturi and said accumulator.

65. The method as recited in claim 61, wherein said method further comprises the step of:

situating a valve in said conduit between said accumulator and said pump.